DOCUMENT RESUME

ED 030 760 VT 008 921

Manpower Requirements for Air Traffic Control and Flight Service Specialists in Indiana.
Purdue Univ., Lafayette, Ind. Office of Manpower Studies.
Report No-MPR-69-2
Pub Date 23 Jun 69
Note-24p.
Available from-School of Technology, SCC-A, Purdue University, Lafayette, Indiana 47907 ($1.50)
EDRS Price MF-$0.25 HC-$1.30
Descriptors-*Aviation Technology, Employment Experience, *Manpower Needs, *Occupational Information, Professional Education, Technical Education, *Traffic Control, Vocational Education
Identifiers-Indiana

As of January 1, 1968 the Federal Aviation Administration (FAA) of the United States Department of Transportation employed 6,963 controllers in airport towers, 7,617 controllers in Air Route Traffic Control Centers, and 4,459 flight service specialists at airport locations. Projected needs are as follows: (1) Controllers in airport towers: 1970--8,931, 1980--15, 247, (2) Controllers in Air Route Traffic Control Centers: 1970--10,407, 1980--16,953, (3) Flight service specialists: 1970--4,534, 1980--10,781. In Indiana, 200 controllers were employed in control towers, approximately 400 controllers in the Indianapolis Air Route Traffic Control Center, and 75 flight service specialists at airport locations. Projected needs for new personnel in Indiana are: (1) controllers in airport towers--50 per year, (2) controllers at control center--200 for the coming year, and (3) flight service specialists--20 per year. In addition to manpower requirements the document presents the following kinds of occupational information for the three types of specialists: (1) nature of the work, (2) availability of jobs in Indiana and nationally, (3) wages, (4) opportunity for advancement, (5) job entrance requirements, and (6) opportunities for training. A separate section discusses education for professional careers. (JK)

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

MANPOWER REQUIREMENTS
for
AIR TRAFFIC CONTROL
and
FLIGHT SERVICE SPECIALISTS
in
Indiana

MANPOWER REPORT 69-2

23 JUNE 1969

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LAFAYETTE, INDIANA 47907

VT008921

Manpower Requirements
for
Air Traffic Control and Flight Service Specialists
in Indiana

The purposes of this report are to describe the duties of these specialists; present the related employment and projected manpower requirements for Indiana in detail and for the nation in general; provide information about their training and education, qualifications and advancement; and offer some pertinent conclusions and recommendations.

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Acknowledgement is gratefully made to the following for their assistance and advice:

Prof. Charles F. Holleman, Chairman, General Flight Section, Department of Aviation Technology, School of Technology, Purdue University.

Mr. Walter Kaestner, Evaluation and Proficiency Development Officer, Indianapolis Air Route Traffic Control Center, FAA; Weir Cook Airport, Indianapolis.

Mr. Jerrold L. Landis, Director, Professional Air Traffic Controllers Organization, (Indianapolis Office).

Prof. James R. Maris, Head, Department of Aviation Technology, School of Technology, Purdue University.

Mr. Lonnie D. Parrish, Chief of Indianapolis Air Route Traffic Control Center, FAA; Weir Cook Airport, Indianapolis.

Note: Copies of this report - and those listed on pages 18, 19 and 20 are available at $1.50 each. (Indiana Government and Educational Offices exempted.) Please send order and check payable to Purdue University, to Prof. J. P. Lisack, School of Technology, SCC-A; Purdue University, Lafayette, Indiana 47907.

TABLE OF CONTENTS

Section	Title	Page
1	INTRODUCTION	1
2	AIR TRAFFIC CONTROL SPECIALISTS	
	General	2
	Fig. 1. Flight Control	2
	Air Traffic Control Specialist (FAA) at FAA Airport Traffic Control Tower	
	Nature of Work	3
	Working Conditions	3
	Where the Jobs Are - Nationally	3
	Employment and Requirements in Indiana	3
	Outlook for the Future	4
	Air Traffic Control Specialist (FAA) at FAA Air Route Traffic Control Centers	
	Nature of Work	4
	Working Conditions	4
	Where the Jobs Are - Nationally	4
	Employment and Requirements in Indiana	4
	Outlook for the Future	5
	Air Traffic Control Specialists in General	
	Wages	5
	Opportunities for Advancement	5
	Requirements to Enter the Job	6
	Opportunities for Training	6
3	FLIGHT SERVICE SPECIALIST	
	General	7
	Flight Service Specialist (FAA) at Flight Service Stations	
	Nature of Work	7
	Working Conditions	7
	Where the Jobs Are - Nationally	7
	Employment and Requirements in Indiana	7
	Wages	7
	Opportunities for Advancement	7
	Requirements to Enter the Job	8
	Outlook for the Future	8
	Opportunities for Specialized Training	8

TABLE OF CONTENTS (continued)

Section	Title	Page
4	EDUCATION FOR PROFESSIONAL CAREERS	
	Problem of Education for Professional Careers	8
	Some Views From An FAA Official	8
	Some Views From A PATCO Official	10
5	PROJECTED TOTAL MANNING REQUIREMENTS TO 1980	
	General	12
	Projected Total National Manpower Requirements to 1980	12
	Table 1. Total Manning Requirements to 1980	
	Projected New Air Traffic Control and Flight Specialist Jobs (to 1980)	12
	Table 2. New Air Traffic Controller Jobs	
	Review	12
6	DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS (On buff pages)	
	Needs	13
	Training and Education	13
	Conclusions and Discussion	14
	Recommendations	15
	APPENDIX	
I	Selected Bibliography	17
	ATTACHMENT	
I	Bibliography of Other Manpower Studies and Reports	18

Manpower Report 69-2

AIR TRAFFIC CONTROLLERS
and
FLIGHT SERVICE SPECIALISTS

1. Introduction. The rapid development of air transportation and the myriad of civil aviation and supporting activities has been tremendous in the past twenty years. Projections all point to continuing rapid growth. As a greater variety and more and faster aircraft fill the air, the problems of avoiding collisions and minimizing delays become more complex and critical.

The Federal Aviation Administration (FAA) of the U.S. Department of Transportation is charged with the administration and enforcement of all federal air regulations to assure the safety of air transportation. The FAA utilizes highly qualified air traffic control specialists, to:

(1) direct local air traffic on and near airports with FAA control towers (e.g. taxi, approach, landing and take-off),
(2) give pilots instructions, air traffic clearances, and advice along his flight path, and keep track of progress of all instrument flights from FAA Air Route Traffic Control Centers, and
(3) render pre-flight and emergency assistance to all non-airline civil and military pilots on request from FAA Flight Service Stations.1/

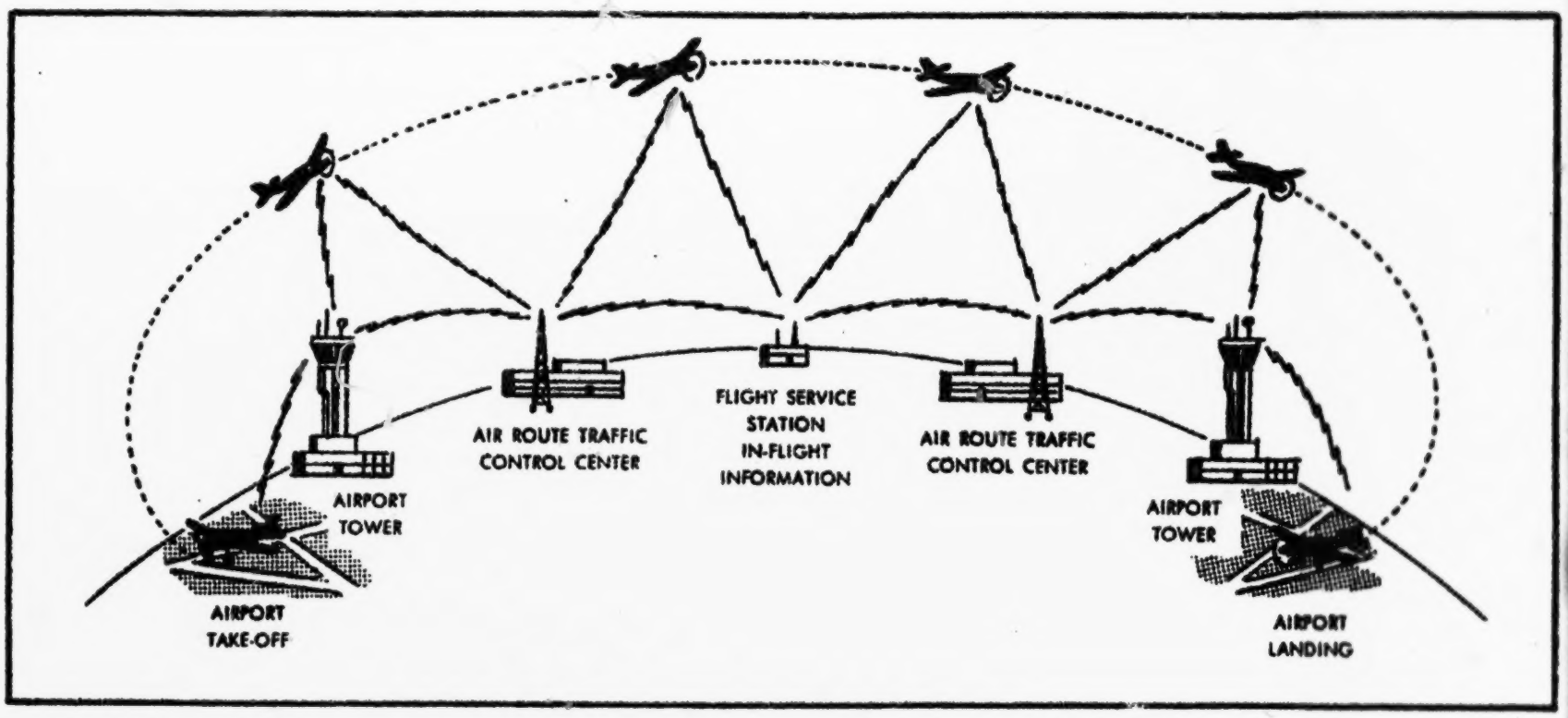
This manpower report includes a brief description of the duties and work of Air Traffic Control and Flight Service Specialists; the related employment and projected requirements for Indiana in detail and for the nation in general; information about their training, qualifications and advancement; and pertinent conclusions and recommendations.

1/ Reference identification number; see attached Selected Bibliography on page 17.

2. Air Traffic Controller Specialists. (D.O.T. 193.168)[2/]

General. Air traffic controllers are the guardians of the airways. They are FAA employees who give instructions, advice and information to pilots, usually by radio or signals, as aircraft taxi on or fly in the vicinity of airports or between them. (See Fig. 1.) When directing aircraft, traffic controllers must consider many factors including weather, geography, the amount of traffic and the size, speed and other operating characteristics of aircraft. The men who control traffic from control towers on and in the areas around airports are known as airport traffic controllers; those who guide aircraft between airports from FAA Air Route Traffic Control Centers are called air route traffic controllers.[3/] Each is discussed in turn.

FIG. 1. FLIGHT CONTROL



Air traffic control towers, centers, and flight service stations assist pilots from flight planning to takeoff to landing.

AIR TRAFFIC CONTROL SPECIALIST (FAA)
at FAA AIRPORT TRAFFIC CONTROL TOWER

Nature of the work. The Air Traffic Control Specialist at FAA airport traffic control towers directs air traffic so it flows as smoothly as possible. He gives pilots taxiing and takeoff instructions, air traffic clearances and advice based on information received from the Weather Bureau, air route traffic control centers, aircraft pilots, and other sources. He transfers control of aircraft on instrument flights to the Air Route Traffic Center (ARTC) controller when the aircraft leaves his airport control area and receives from ARTC control of aircraft on instrument flights flying into his airport control area. He operates runway lighting systems and airport traffic direction indicators and prepares reports on air traffic and communications. He must be able to recall quickly registration numbers of aircraft under his control, their types and speeds, positions in the air, and also the location of navigational aids in his area and distances between them.1/

Working Conditions. He generally works a forty-hour week in FAA control towers at airports, using radio, radar, telephone, traffic control light, and other devices for communication. Shift work is involved. Each controller is responsible, at separate times, for; giving taxiing instructions to aircraft on the ground, takeoff instructions and flight clearances, or directing landings of incoming planes. These individual duties are rotated among the staff about every hour or two hours at busy locations. At busy airports controllers must work at top speed. Tension often builds up as traffic mounts, especially when poor flying conditions occur and traffic stacks up. Brief rest periods provide some relief, but are not always possible. Radar controllers must work at times in semi-darkness, as well as in rooms with normal lighting.1/

Where the Jobs Are, (Nationally). FAA employed 6,963 controllers in airport control towers located at 338 airports (as of January 1, 1968) scattered throughout the nation, mostly in areas having moderate to heavy air traffic. A few towers are located outside the continental United States in Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Employees are subject to relocation to meet staffing requirements.1/ See Section 5 on p. 12 for projected manning requirements in detail.

Employment and Requirements in Indiana. There are six FAA airport traffic control towers in Indiana with a total complement of approximately 200 air traffic control specialists. Mr. Lonnie Parrish, Chief of the Indianapolis Air Route Traffic Control Center, and Mr. Walter Kaestner, Evaluation and Proficiency Development Officer4/, also from the FAA Air Route Traffic Control Center at Weir Cook Airport at Indianapolis, and Mr. Jerrold L. Landis, local Director of the Professional Air Traffic Controllers Organization (PATCO)5/ provided the following information: after careful review of past experience, and the current and projected programs and budget, the need in Indiana for new (entrant) FAA air traffic control specialists at airport traffic control towers is approximately 50 per year. Msrs. Parrish and Kaestner also advise that 131 new positions were authorized in FY 1969 in Illinois, Indiana and Michigan, and that a number of control towers are now under-manned. Further, there is a good possibility that two additional FAA control towers will be authorized in Indiana during the next two or three years: this would increase the number of specialists needed in order to fill the new positions and meet resulting higher attrition requirements.

Note: Objectives of the Professional Air Traffic Controllers Organization (PATCO): To preserve and promote in every reasonable way the safety of air traffic movement within the air traffic control jurisdiction of the United States, its territories and possessions.

Outlook for the Future. In line with predictions for continued rapid growth of all sectors of aviation, the need for air traffic controllers will continue to rise. More airports will have the required amount of air traffic to qualify for air traffic control towers and additional tower controllers will be needed to staff them. An increased emphasis on providing the maximum amount of safety devices will result in continued requirements for controllers.1/ (See page 12.)

AIR TRAFFIC CONTROL SPECIALIST (FAA) at FAA AIR ROUTE TRAFFIC CONTROL CENTERS

Nature of the Work. The Air Traffic Control Specialist at FAA Air Route Traffic Control Centers gives pilots instructions, air traffic clearances and advice regarding flight conditions along his flight path while flying the federal airways. (See Fig. 1.) He uses flight plans and keeps track of progress of all instrument flights from point to point within his Center's control area. He transfers control of aircraft on instrument flights to the controller in the adjacent Control Center when the aircraft leaves his Center's control area; he also receives control of flights entering his area of responsibility from adjacent Centers. He estimates the time of an aircraft's arrival over a navigation fix and maintains records of flights under his control.1/

Working Conditions. Air Route controllers work at FAA Air Route Traffic Control Centers forty hours a week, using electronic computers, radio, radar, teletype machines, telephones, and other electronic communications devices. Shift work is involved. They work in semi-darkness, and unlike the tower controller, never see the aircraft they control except as tiny "blips" of light on the radarscope. In areas of heavy traffic, work is very demanding. Registration numbers of all aircraft under control must be recalled quickly, as well as types, speeds, and distances between navigational aids and points for hundreds of miles along the federal airways in his control area.1/ The author has formed the opinion through numerous conversations with professionals in the field, that the stress and responsibilities of this work mandate careful selection of trainees, full qualifications to handle the job, and a potential to move into other related jobs successfully. The attrition rate is now relatively high during the 3½ to 4 years experience needed to become a professional air traffic control specialist. More controllers are needed.

Where the Jobs Are, (Nationally). FAA employed 7,617 controllers at 27 Air Route Traffic Control Centers located throughout the nation in January 1968. Centers are usually found near a major city but outside the control area of the closest major airport.1/ See Section 5 on p. 12 for projected manning requirements in detail.

Employment and Requirements in Indiana. One of the 21 Continental U.S.* Centers is located at Weir Cook Airport in Indianapolis; the Center's present complement is 466 of which approximately 400 are air traffic control or related specialists. (Station complement was 329 in FY 1968.) Mr. Lonnie Parrish and Mr. Walter Kaestner4/ of our Air Traffic Control Center, and Mr. Jerrold L. Landis of PATCO,2/ have determined after careful review, that the total needs for new FAA air traffic control specialists for our Center are about 200 for the coming year! This is based on a need to man an increase of 101 positions in the Center for FY 70,** of which approximately 90 are air traffic control specialists, and

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*There are six other U.S. Air Route Traffic Control Centers (Alaska, Hawaii, Guam etc.).

**Based on tentative authorization for FY 1970.

for expected attrition from the current station complement. It is expected that this growth will continue into the future... the needs already being apparent for the next three or four years. As the station complement grows, additional trained manpower will be needed to fill new jobs and attrition.

Outlook for the Future. In line with predictions for continued rapid growth of all sectors of aviation, the need for air traffic controllers will continue to rise. As airports generate greater volumes of air traffic, and as emphasis on providing the maximum amount of safety grows, there will be a continuing requirement for additional controllers at Air Route Traffic Control Centers...1/ See Section 5 on page 12 for projected requirements.

Special Note: The wages, opportunity for advancement, requirements to enter job and opportunities for training, as described in the Counselor's Guide1/ are the same for air controllers for both FAA airport traffic control towers and FAA Air Route Traffic Control Centers. Therefore, discussion of these topics is presented below for air traffic control specialists in general.

Wages. The starting grade is GS-6, at $6,137 per year ($512 per month). Trainees are paid while learning their jobs. The highest grade for an operating professional (journeyman) air traffic control specialist is GS-12 which pays $11,461 to $14,899 per year ($955 to $1,241 per month). (Note: These General Schedule Federal Civil Service Classified Pay Rates are now undergoing an upward revision.) For comparative purposes the Purdue University Placement Service reported that the average accepted salaries of applied technology (two-year associate degree curricula) graduates for June, 1968 was $609; the B.A.-B.S. accepted monthly salaries of Purdue University graduates from all schools averaged $717.6/ The average salary for graduates of bachelor degree programs in January, 1969 was $754. See footnote on next page.

Opportunities for Advancement. Promotion from air traffic control trainee to higher grades as assistant controller and professional controller depends upon the employee's performance and satisfactory achievement in his training program and his qualifications. Increases in grade (with accompanying increases in salary) are fairly rapid, but grades above GS-12 are for positions of watch supervisor, staff officer, and chief. During the first year, the trainee-controller is on probation and then he may advance from positions backing up professional controllers to primary positions of responsibility. It takes a trainee-controller from 3½ years* (minimum) to about six years of experience to reach the professional level. Professional controllers may be selected for research activities with FAA's National Aviation Facilities Experimental Center at Atlantic City. Some are also selected to serve as instructors at the FAA Academy at Oklahoma City.1/

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*Promotion to a position as air traffic control programmer is possible for controllers working at FAA Centers.

Requirements to Enter the Job. He must be able to pass a physical examination and he must be free from color blindness. One of the following is also required:

Four years of college with a bachelor's degree.*
Three years of responsible work experience.*
Instrument flight rating.
Airline dispatcher certificate.
FAA navigator certificate.
Experience as an air traffic controller in the military services.

Applicants must also pass a two-hour written test and a personal interview during which alertness, decisiveness, diction, poise, and conciseness of speech are evaluated. A small number of women are employed presently as air traffic controllers. Few occupations make more rigid physical and mental demands upon employees than that of an air traffic controller.1/

Opportunities for Training. Trainees now receive 6 to 8 weeks of instruction at a regional training location or at the FAA Academy in Oklahoma City, Oklahoma. After completion of the training period they are assigned to trainee positions for on-the-job training under close supervision for six months. Permanent assignment as an assistant controller follows successful completion of training. The FAA conducts up-grading training programs for controllers from time to time. It takes at least $3\frac{1}{2}$ years on the job to become a professional controller. Training in air traffic control towers may be obtained in the military service and many military air traffic controllers take jobs with the FAA after they leave the service.1/

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*Mr. Walter Kaestner of the FAA4/ advises that formal education is substituted for work experience on an equal time basis (e.g., a 4 year college program -- 9 mos. @ yr. X 4 yrs. = 36 months -- equates with three years' experience.) The GS rating qualification standards generally applied are:

G.S. 5 3 years general experience
G.S. 7 3 years general experience plus 1 year of specialized work
G.S. 9 3 years general experience plus 2 years of specialized work.

General experience must be in progressively more responsible work in appropriate functions.

FLIGHT SERVICE SPECIALIST (FAA) at FLIGHT SERVICE STATIONS[1]

3. Flight Service Specialist (FAA).

General. The flight service specialist performs his work at an FAA Flight Service Station on the request of non-airline civil and military pilots. (See Fig. 1.) His qualifications differ somewhat from that required of air traffic controllers (e.g. he must have at least 350 hours flight time as a co-pilot or higher). The description of this specialist is presented below.

Nature of the Work. The Flight Service Specialist at FAA Flight Service Stations renders pre-flight, in-flight and emergency assistance to all non-airline civil and military pilots on request. He gives information about and broadcasts weather conditions at airports and along flight paths, relays air traffic control instructions between controllers and pilots, assists pilots in emergency situations, and initiates searches for missing or overdue aircraft.

Working Conditions. Shift work is involved. He uses a telephone, radio and teletypewriter, and radio telephones. He works in office situations close to communications equipment for forty hours as a normal work-week.

Where the Jobs Are, (Nationally). FAA Flight Service Stations are found at 328 airport locations throughout the country, and at 12 points outside the country. About 4,459 Flight Service Specialists were employed as of January, 1968. See Section 5 on p. 12 for projected manning requirements in detail.

Employment and Requirements in Indiana. There are five FAA Flight Service Stations located at Indiana airports. The total complement of flight service specialists at these Stations is approximately 75. Information from Mr. Lonnie Parrish and Mr. Kaetner of the FAA[4] and Mr. Jerrold L. Landis of PATCO[5] indicate that, after careful review, they have determined the needs for new flight service specialists in Indiana approximate 20 per year (19 were hired last year to meet attrition).

Wages. The starting grade is GS-6, at $6,137 per year ($512 per month). Trainees are paid while learning their jobs. The highest grade for the Flight Service Specialist is GS-9 which pays $8,054 to $10,475 per year ($671 to $873 per month).

Opportunities for Advancement. Excellent opportunities exist for the qualified employee to progress to higher grade levels as he gains experience and as his responsibilities and the complexity of his duties increase. Beginning as a trainee in the Flight Service Station, he may advance to a Communications (Journeyman) Specialist to a Watch Supervisor, and then to Chief of the Facility -- the top administrator at the station. As a further upward step, a few positions at higher grade levels, are available in FAA area offices with administrative responsibilities over all Flight Service Stations within the area's jurisdiction.

Requirements to Enter the Job. Candidates must be able to pass a physical examination. One of the following is also required:

Three years of responsible work experience.
Air traffic control facility rating.
Airline dispatcher certificate.
FAA navigator certificate.
Experience in air traffic control with the military services.
2½ years air/ground communications or flight operations experience.
350 hours flight time as co-pilot or higher.

Applicants must also pass a two-hour written test and a personal interview during which alertness, decisiveness, diction, poise, and conciseness of speech are evaluated. A small number of women are employed presently at Flight Service Stations.

Outlook for the Future. The number of Flight Service Specialists is not expected to increase proportionately to jobs in other areas of air traffic control employment. Flight Service Stations will serve larger areas with the greater use of long distance telephone and other communications devices. Even though the number of opportunities for jobs as Flight Service Specialists may not increase greatly, those jobs that are available are stepping stones to air traffic control careers in FAA-operated airport control towers and at Air Route Traffic Control Centers.[1]

Opportunities for Specialized Training. Flight service specialist trainees now receive fourteen weeks of instruction in vocational programs at the FAA Academy in Oklahoma City, Oklahoma. Each graduate is assigned to a flight service station where he takes on the responsibilities as a flight service specialist. As he develops his proficiency and judgement, he assumes greater responsibilities at the station.[7] See Section 5 on page 12 for projected manning requirements in detail.

4. Education for Professional Careers.

Problem of Education for a Professional Career. In addition to the problem of providing a sufficient number of qualified air traffic control specialists - is the problem of providing education for achieving professional status and expanding and increasing later career opportunities. There is considerable evidence and agreement attesting to the desireability of a broad, college-degree educational base for professional controllers. Not only does such an educational background substitute for some experience to gain rating credit, it provides for improved early job effectiveness; it also is becoming vital for keeping abreast of changes and increasing responsibilities. An adequate educational foundation to be built upon through continuing education and experience is a prerequisite to upward career progress and as preparation for subsequent related diverse occupations. Some pertinent views on this subject are presented below:

Some Views From An FAA Official. In a recent article[8] by Robert F. O'Neil, Special Assistant for Aviation Education in the FAA, he pointed out that there are approximately 900 administrative type positions which can be filled eventually by qualified air traffic control specialists. However, most of these positions require additional knowledge and abilities to perform staff

and administrative functions. Further, Mr. O'Neil stated that many educational institutions (high school and post-high school) having aviation and aerospace courses and programs need qualified instructors in their attempts to meet the growing need for highly skilled employees in the aviation industry. Other jobs available to air controllers who can qualify include airline operations, airport manager, fixed base operator, flight instructor, ground instructor, aviation trades salesman or serviceman, and many more.

Mr. O'Neil further stated that traditionally, the FAA has met needs by hiring much of its technical work force from among ex-military personnel -- which has presented the agency with some problems. Generally, these personnel have limited educational backgrounds.

The following quote from his article is directly appropriate:

> "The increasing complexity of agency jobs requires a more highly trained and more broadly educated employee than we have required in the past.... The agency has found that it cannot rely on the general labor market to meet its recruitment needs. We cannot expect to recruit from the streets, people with the training and the education we desire. The positive approach is to work with the nation's educational system to help develop the kinds of people we will be needing.... If sound advice and counsel are provided, the nation's education system could train potential employees as effectively, or even more effectively, than the agency is able to do after they become employees....
>
> "In the discussions with educators, FAA personnel suggested that the institutions develop an aviation technology curriculum which would provide the student with a broader base in aviation rather than restricted to air traffic control. The educators were informed of the special tests required of all air traffic control candidates: Civil Service, aptitude, psychological and class II medical examination. Also, that the FAA could not guarantee jobs for the graduates. It would be inconceivable, however, for the FAA, which will hire 4,000 air traffic control specialists each year for the next ten years, not to encourage the development of the best possible candidates."8/

Mr. O'Neil, in the same article explained how a "work study" program has been designed successfully.

Some Views From a PATCO Official. An expression of concern in meeting the requirements for additional highly trained personnel both with the government service and in private industry was made recently by the Chairman of the PATCO Education Committee, Mr. Steve Bodman.2/ He referred to a recently completed PATCO study and stated that present and past employment practices failed to provide for trained manpower needs on a planned basis. Mr. Bodman writes that:

> "A computerized environment, both terminal and enroute, and other changes in equipment will only partially solve the chaotic operational requirements. Continued changes in equipment and methodology by the system user will call for additional air traffic control personnel with a broad base education to advance within the Federal Aviation Administration (FAA) under a "divergent career" concept, based on actual experience within the working system...
>
> "A totally new concept of staff expansion and training must be implemented if the total mission of the FAA is to be completed...
>
> "An immediate need exists to use the training and educational capabilities of the universities and junior colleges of the nation as an adjunct to the present FAA training facilities to provide a steady source of qualified professional employees. Study has indicated that the professional educators are prepared to implement degree programs for professional air traffic control candidates. In some cases they have already done so.
>
> "The full four year baccalaureate course of study would include an air service major and minors in personnel management, business administration, computer technology and other subjects. Additional training would include the flight section leading to a commercial license and instrument rating as part of the curriculum. The two year junior college program could readily be oriented to take advantage of the existing FAA training facilities for further specialized training of the new employee. Training costs would be reduced to a minimum and maximum effectiveness would be obtained.
>
> "Additional factors beyond formal education studies which play an important part in the Air Traffic Service are performance under stress, emotional stability, reaction time and personal initiative. Attention to those points must be given not only in the academic classroom but also in the field facilities through implementation of a summer work program for ATC students.
>
> "The professional stature of the FAA within the aviation community must be enhanced through the practical application of the national education system. Continuity of training must be implemented and maintained. Complete preparation of the employee

for advancement prior to employment must be provided for. But most importantly, the air traffic controller must be prepared to keep pace with the state of the art of the aviation community.

"Actual implementation of such a program must be undertaken at the Washington level, but investigation indicates that operational field facility personnel, attached to the headquarters staff and located in the field to coordinate at the local level, should be an integral part of the program. The field training representatives could also devote a certain amount of time to helping field facilities perform proficiency controller checks and administer proficiency training to existing Air Traffic Service personnel. This would provide a continuity that is presently lacking in upgrade and ingrade training at the working level."9/

Note: Also, please recall that listed first after ability to pass a physical examination - in meeting requirements to enter the job of air traffic controller -, is "four years of college with a bachelor's degree"... Such education substitutes for job experience.

The national manpower requirements projected to 1980, are presented in Section 5 on the next page.

For the convenience of readers who wish to refer only to the final discussion, conclusions and recommendations, these sections are presented on pages 13, 14, 15 and 16 (buff-colored paper).

5. Projected Total Manning Requirements to 1980.

General. The development of aviation will undoubtedly continue in its rapid growth. There will be an increasing level of complexity as well as volume in the handling of air traffic and provision of flight services. The need for qualified personnel to fill new jobs and to meet attrition - the need for competence in a field where technological advances occur continuously - the need for education to assure confidence, security, and professionalism - point up that there are both quantitative and qualitative aspects of the problem. The broad educational implications were described in the preceding section: discussion directly related to the qualitative aspects of the problem. Previous discussion also presented the quantitative manpower needs in Indiana. The following data concern the general quantitative aspects from a national standpoint.

Projected Total National Manpower Requirements to 1980. The following data is based on the Fiscal Year 1970 budget, the present five year plan and program, and a projection to 1980 considering estimates of aircraft, work-load, and forecasts of pertinent related plans and activities.[10] Anticipated manning requirements by fiscal year are shown in Table 1.

Function	Fiscal Year						
	1970	1971	1972	1973	1974	1975	1980
Air Route Traffic Control Centers	10,407	12,330	12,410	12,870	13,302	13,913	16,953
Airport Traffic Control Towers	8,931	9,608	10,221	10,737	11,286	11,884	15,247
Flight Service Stations	4,534	6,075	6,457	6,861	7,286	7,756	10,781

TABLE 1. TOTAL MANNING REQUIREMENTS TO 1980

Projected New Air Traffic Control and Flight Service Specialist Jobs (to 1980). The large number of total new jobs was shown graphically in Table 1; the annual increase for new air control specialist jobs are shown in Table 2.

	FY Annual Increase					
	1971	1972	1973	1974	1975	1980
All Controllers	4,141	1,075	1,380	1,406	1,679	9,428

TABLE 2. NEW AIR TRAFFIC CONTROLLER JOBS

Review. The foregoing tables reflect the tremendous problem of acquiring personnel to fill new air traffic control specialist jobs - as well as the new jobs at higher grade levels. In addition to meeting these growth needs, losses due to attrition must also be met. Considering all these data, the estimate of an input of some 4,000 personnel each year, as reported by Mr. Robert F. O'Neil[8] appears to be borne out. Likewise, the need for a broader educational base to meet the impact of advancing technology, to provide for professionalism and career mobility must be met.

6. Discussion, Conclusions and Recommendations.

Needs. There is little question that a serious national need exists for qualified FAA air traffic controllers and flight service specialists. The FAA will hire some 4,000 air traffic control specialists each year for the next ten years.7/ In Indiana alone, the near future annual recurring requirements for approximately 250 new (entrant) FAA controllers have been determined as indicated:

Air traffic control specialists --

For airport traffic control towers, 50 per year.

For the Air Route Traffic Control Center (at Indianapolis) 200 per year.

In addition, Indiana requires approximately 20 FAA flight service (station) specialists each year.

These total requirements may drop slightly when (if) expansion of new jobs slows and needs are largely due to replacement of losses as a result of attrition. However, needs in Indiana and nearby states will far exceed the total output of any educational program producing 200 graduates per year in the forseeable future. All indications are that more new controllers will be needed.

Training and Education. Another major problem - in addition to providing sufficient numbers of qualified air controllers and flight service specialists in Indiana and nationally, - is that of the need to prepare them as professionals with the potential to advance and to move successfully into other related occupations. For example, there is a need to fill an increasing number of complex FAA jobs requiring more highly trained and more broadly educated employees than have been required in the past. Likewise, many job opportunities in a variety of government, civil aviation, and educational fields await those having the required levels of education, training, and experience. Career progress, and later career avenues are very limited for those having restricted educational backgrounds and experiences.

The FAA and PATCO authorities are desirous of working with educators in the planning for and conduct of appropriate aviation technology programs which will provide an adequately broad educational base to help assure graduates of successful professional careers.*

Conclusions and Discussion. A properly designed college-level degree educational program is needed in Indiana to help provide adequately prepared personnel for air traffic control and flight service related occupations who are needed in this State and nationally. It should be noted that formal college education is accepted in lieu of experience to qualify for higher ratings, as are pilot experiences and instrument ratings.

A need also exists to up-date and provide continuing education courses for present air traffic controllers and flight service specialists.

The program courses, facilities and experiences, must be worked up in cooperation with FAA and Civil Service authorities and professionals in the field to assure that appropriate curriculum objectives and standards are established, means to achieve them are identified, and the administration and authenticity of the program are facilitated. Consideration should be given to take advantage of the existing FAA training facilities for specialized training and advantage should be taken of FAA experiences in training controllers. This program appears to be compatable with and complementary to present programs offered in the Department of Aviation Technology.

Graduates must be prepared for the necessary examinations and tests, be provided an adequate educational base for a successful career as a controller and related diverse occupations.

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*Note: Mr. Joseph Tippets, Associate Administrator for Personnel and Training, FAA, has assigned members of his staff to work with the Aviation Education Staff to help develop needed courses of action.

Applicants** for the course must be pre-screened to assure they meet the prescribed physical and mental requirements. A public relations and student counseling effort would be helpful to interest both boys and girls in choosing this occupational area.

The possibilities of "work study," "co-op," and "summer work" programs appear to be good.

Due to the demanding nature and stress of the work of air traffic control specialists, and the constant and critical pressures, it is essential that a systems approach be applied which assures selection of proper candidates, full and adequate preparation for their work and continuing professional development.

Recommendations:

(1) It is recommended that an appropriate college-level degree program be offered by the Department of Aviation Technology, School of Technology, Purdue University, to prepare graduates for positions as air traffic control specialists and flight service specialists. The program should provide a sufficiently broad educational base to enhance the possibilities of a successful professional career as an air traffic control specialist and subsequently, in related diverse occupations.

(2) Close liaison with the FAA, Federal Civil Service authorities, and professionals in the field should be achieved to assure that standards are established to provide guidelines for selection of applicants who possess the desireable physical and mental standards; that students are adequately prepared for the required tests and examinations; and that graduates are provided an adequate educational base for a successful career. Further, that policies, authorities, responsibilities and procedures be so arranged that the program is administered effectively and legitimately.

(3) Consideration should be given to take advantage of existing FAA training facilities and experiences to date in the training of air traffic control specialists.

**Note: Junior Air Force ROTC programs can be used to identify and help counsel appropriate high school students as to the career opportunities in air traffic control. Members of the Civil Air Patrol also should be counselled.

(4) Related work-study, co-op, summer-work, and continuing education programs should be explored and implemented where feasible.

(5) Due to the need for close cooperation and the inter-faces between the different agencies, activities, and personnel involved, it is recommended that an air traffic control advisory committee be established to help plan and assist in the implementation of necessary actions to initiate and offer the program.

(6) Public relations, counseling, and recruiting efforts must be planned and actions implemented to assure that both boys and girls are aware of career opportunities and related training and education programs.

(7) Due to the often demanding nature and stress of the work in air route traffic control centers and airport control towers, it is essential that careful screening of applicants be accomplished and adequate education and training be provided to assure their full qualifications and professional development.

Selected Bibliography

Reference Number	Title - Publication - Date
1	Aviation, Where Career Opportunities Are Bright, Counselor's Guide; First Edition, 1968, National Aerospace Educational Council, Washington, D. C., pp. 84 thru 89.
2	Dictionary of Occupational Titles, Definitions of Titles Vol. I, Third Edition, 1965; U. S. Dept. of Labor, p. 12.
3	Occupational Outlook Handbook, Bulletin No. 1550, 1968-69 Edition; U. S. Dept. of Labor, p. 649.
4	Telephone conversation on 10 June, 1969 with Mr. Lonnie Parrish, Chief of Indianapolis Air Route Traffic Control Center, FAA; and phone conversation of 18 June 1969 with Mr. Walter Kaestner, Evaluation and Proficiency Development Officer also of the Control Center, as documented in letter of 19 June 1969.
5	Telephone conversation of 10 June, 1969 with Mr. Jerrold L. Landis, Regional Director (located at Indianapolis), Professional Air Traffic Controllers Organization (PATCO), (1725 "K" Street N. W., Suite 71, Washington, D.C., 20006, home office location).
6	Purdue University Placement Service Report, "Accepted Salaries of Graduates, June, 1968", Lafayette, Indiana.
7	"Controller College - FAA Academy Laboratories Simulate Traffic Problems", Part II, FAA Aviation News, February 1969, p. 10.
8	"Over But Not Out" article by Robert F. O'Neil, Special Assistant for Aviation Education, FAA, Washington, D. C.
9	"The Necessity of Professional ATC Training" by Steve Bodman, Chairman, PATCO Education Committee; article in Professional Pilot, Vol. 3, No. 4; April 1969, p. 42.
10	Telephone conversation of 20 June 1969 with Miss Patricia Days of PATCO in Washington, D. C.

BIBLIOGRAPHY OF MANPOWER STUDIES AND REPORTS

School of Technology, SCC-A
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Office of Manpower Studies
Director, Professor
J. P. Lisack

Manpower Report — Title

65-3 - Technician-Level Educational Planning for the Chemical Technology in Indiana, 20 Oct, 1965. Examines industries related to the Chemical technology. Presents scientists, engineers, and technicians as a percent of total employment in major industries. Explains methods of computing technician requirements by industry and locale. Includes related occupational titles and sample chemical technology curriculum.

66-1 - Technician-Level Educational Planning in the Greater Lafayette, Indiana Area, Concerning the Electrical/Electronic Technology, January, 1966. Determines numbers of technicians needed annually in industries employing electrical/electronic type technicians. Examines ten year trends in local employment and projects requirements into future. Discusses occupations concerned, orientation of educational programs, curricula, and collateral items.

66-2 - Employment Trends in Five Indiana Counties, 1 February 1966. Presents population and employment trend data for significant industries to facilitate technical education and facilities planning. Compares county and state data.

66-3 - Occupations, Qualifications, and Areas of Work in Architectural, Construction and Related Fields for Jobs Above the Skilled Craftsman Level, 10 March 66. Describes selected occupations to assist faculty concerned with determining requirements for and objectives of related educational programs. Occupational titles, definitions and qualifications are shown with required education, vocational preparation, and aptitudes.

66-4 - Foundry Technicians and the Foundry Industry in Indiana, 30 March, 1966. Examines the foundry industry, manpower requirements, and the kind of educational program needed - for foundry technicians. National manpower factors are corroborated in a survey of 125 Indiana foundries: survey respondents' opinions of educational needs (by subjects and courses) are included.

66-5 - Employment Trends and Technician Needs in Wayne County, Indiana, "The Richmond Study", 4 April, 1966. Determines an approximation of the kinds and numbers of technicians needed for preliminary educational program planning. Presents economic, manpower and employment trends data as well as listings by location and description of products of the more important industries. Describes methods used.

66-6 - Methods and Rationale for Determining Technician-Level Manpower Requirements by Locale - and for a Specific Industry, 20 July, 1966. A general review of sources of manpower data, ratios, factors, and methodology related to computation of estimates of technicians for industries or for a given locale.

66-7 - Selected Technical Education Needs in Howard County, Indiana, "The Kokomo Study", 1 August, 1966. Examines manpower, industry and economic factors to identify kinds and levels of post-high school technical educational programs that may be needed. Presents results of survey wherein the needs for these identified programs are verified. Describes methods and instruments used.

66-8 - Selected Manpower and Employment Data for Delaware County, Indiana and Six Contiguous Counties, 15 August, 1966. Compiled to assist in broad initial planning for establishing regional educational and training programs. State and regional population; employment, wage and industry data; and manpower factors are included.

Manpower Report — Title

66-9 - Region One Manpower Study. (N.W. Sector of Indiana) 18 October, 1966. This report is a projection - ten years into the future - for seven counties. It includes estimated changes in employment by industry and changes within occupational groups. Has special notes on needs for initial and continuing education, and on rising hiring standards.

66-10 - Manpower and Training Needs in Fluid Power, 30 November, 1966. Contains (1) Specific manpower requirements at five occupational levels in fluid power technology - with factors applicable to various major industry groups; (2) Types of educational courses needed; (3) The depth of understandings required at each occupational level in fluid power courses, and supporting technical and other courses; (4) Comments of representatives from Indiana industries. Includes methods and questionnaire used.

67-1 (Indianapolis); 67-3 (Calumet); and 67-4 (Fort Wayne) - Manpower Requirements for Industrial Illustrators and Draftsmen, (thru August, 1967). A series of reports for metropolitan areas indicated containing: (1) Background data re needs, employment, and salaries of technicians and draftsmen; (2) Occupational descriptions, qualifications, education and training; (3) Results of surveys to determine current and future needs and training program information; (4) Discussion of the impact of future technological changes on the drafting processes - and their effects on draftsmen qualifications. The hypothesis is made - and proven - that greater work complexity and advances in technology affecting the drafting processes, have made the utilization of Tracers less profitable; Job entry level is moving to the higher level of Detailer with better educational preparation.

67-2 (Indianapolis); 67-5 (Calumet); 67-6 (Fort Wayne); 68-1 (Kokomo) - Computer and Electronic Data Processing Manpower Requirements, (thru March, 1968). Reports results of research and surveys for metropolitan areas indicated concerning: (1) Background info re computers; (2) Job descriptions and qualifications of 23 computer and EDP occupations; (3) Numbers of people employed, current job vacancies and projected requirements; (4) types of equipments and nature of computer applied functions; (5) Training and educational programs; and (6) Ratios of computer jobs to total employment and job categories.

67-7 - Requirements for Personnel Staff Members and Supervisors, 28 December, 1967. Report contains factors - or ratios - of personnel staff members to total employees in each industry group. The past, present, and projected ratios and trends are developed for first-line supervisors (viz. foremen):

e.g. In 1952, there were 29 employees for each supervisor,
in the early 60's there were 20 employees per supervisor,
in 1967, there were 18 employees per supervisor, and
by 1972, there may be only 15 employees per supervisor.

The annual recurring losses, growth factors, and educational ramifications are described. Factors are applied to industries in the Northeast Region of Indiana.

68-2 - Indiana's Need for Assistants in Veterinary Medical Practice, 15 May, 1968. Study points out the needs for, identification of, description, education and control of auxiliaries to the professional veterinarian. Results of a survey of all practicing veterinarians in Indiana are presented. Report includes: (1) Titles, descriptions, duties and qualifications of animal technicians, small animal hospital attendants, livestock health attendants, and others; (2) The numbers of these auxiliaries now employed, current job vacancies, and future requirements; (3) Salary and training matters; (4) The need for licensure or registration, and methods to be used; (5) Comments of veterinarians; and (6) Related Conclusions and Recommendations.

Manpower Report

68-3 - Study of Computer Use in Medium-sized Manufacturing Firms, 1 August, 1968.
This study examines the utilization of computers by medium-sized manufacturing concerns engaged in the fabrication of non-durable materials or light weight durable materials. Sampling techniques were used to acquire data from companies throughout the U. S. and a five-state midwest region by mail, plus a telephone interview with a special sample of midwest companies. The study includes: usage of EDP equipment, utilization by functional areas, estimated efficiency and dollar return on computer investment, manpower requirements and training and salary matters, major problem areas encountered and summaries of the survey findings. A review of pertinent literature is also reported in the study.

68-4 - A Proposed Land Surveyor Baccalaureate Program and the Need for Land Surveyors in Indiana, 15 September, 1968.
The purpose of this study is to provide data and recommendations concerning land surveyors in Indiana. This report contains the present employment, job vacancies, and projected requirements for land surveyors. Data was acquired through questionnaires sent to all County Surveyors, the State Highway Commission and other government offices, to private practice surveying firms, and to selected firms in industry. The study establishes that substantial present and projected needs exist for land surveyors. The study provides data and information useful for related curriculum development.

A proposed baccalaureate curriculum designed to prepare professional land surveyors is included. Survey respondents indicated a favorable attitude towards the proposed program, gave some constructive suggestions, and indicated they were willing to hire graduates at reasonable salaries.

The requirements for State registration of professional land surveyors are also discussed.

69-1 - Manpower Requirements for Pollution Control and Water Resources in Indiana and a Related Pollution Control Technology Curriculum, 24 February, 1969.
Indiana is no different than most States in the need to cope with mounting problems in air and water pollution control, liquid and solid waste disposal, water resources and allied fields. At the core of many of these problems is the lack of engineers, professionals in physical and life sciences and technicians: this study identifies these occupations and presents current employment and job vacancies, and projected requirements. Manpower data is obtained through an extensive survey of manufacturing industries, water and wastewater plants, government and educational agencies. Also presented in the report is a proposed two-year associate degree program for pollution control technology and the survey respondents reactions to the curriculum; their willingness to hire graduates of this program and estimated salary information are included. Related matters of technician examination, certification or registration are discussed.

NOTE: Copies of these reports are available for $1.50 per copy (Indiana Government and Educational Offices exempted). Please make check payable to Purdue University.